CLAIMS

We claim:

1. A process for converting oxygenate to olefins which comprises:

contacting a feedstock comprising oxygenate with a catalyst comprising a molecular sieve under conditions effective to produce a deactivated catalyst having carbonaceous deposits and a product comprising said olefins;

separating said deactivated catalyst from said product to provide a separated vaporous product which contains catalyst fines;

quenching said separated vaporous product with a liquid medium containing water and catalyst fines, in an amount sufficient for forming a light product fraction comprising light olefins and catalyst fines and a heavy product fraction comprising water, heavier hydrocarbons and catalyst fines;

treating said light product fraction by contacting with a liquid oxygenate substantially free of catalyst fines to provide a light product fraction having reduced catalyst fines content and a liquid fraction of increased fines content;

compressing said light product fraction having reduced catalyst fines content; and

recovering said light olefins from said compressed light product fraction.

2. The process of claim 1 wherein said liquid oxygenate substantially free of catalyst fines is selected from the group consisting of methanol and ethanol.

3. The process of claim 1 wherein said liquid oxygenate substantially free of catalyst fines is at least a portion of said feedstock comprising oxygenate.

4. The process of claim 3 wherein said feedstock comprising oxygenate is heated by said treating.

5. The process of claim 4 wherein said heated feedstock comprising oxygenate is contacted with said catalyst comprising a molecular sieve.

6. The process of claim 1 wherein said liquid oxygenate substantially free of catalyst fines is by-product water from said contacting of the oxygenate with said catalyst, which by-product water is condensed in a recovery unit and treated to reduce catalyst fines content.

7. The process of claim 1 wherein said oxygenate comprises methanol.

8. The process of claim 1 wherein said liquid medium containing water is derived from quench tower bottoms.

9. The process of claim 8 wherein said quench tower bottoms are passed through at least one of a quench heat exchange step and a water-methanol separation step before being cycled to said quench tower.

10. The process of claim 1 wherein said quenching takes place in a quench tower wherein said liquid medium containing water is introduced above where said separated vaporous product is introduced, and said treating of said light product fraction by contacting with a liquid oxygenate substantially free of catalyst fines occurs within the quench tower above where said liquid medium containing water is introduced.

11. The process of claim 10 wherein a liquid draw device is placed above where the liquid medium containing water is introduced, from which liquid draw device said liquid fraction of increased fines content is taken; and

said liquid oxygenate substantially free of catalyst fines is introduced at a point above said liquid draw device.

12. The process of claim 10 wherein said liquid draw device is a chimney tray.

13. The process of claim 11 wherein a vapor-liquid contacting surface is placed between said liquid draw device and where said liquid oxygenate substantially free of catalyst fines is introduced.

14. The process of claim 13 wherein said vapor-liquid contacting surface is provided by at least one material selected from the group consisting of random packing, structured packing and trays.

15. The process of claim 14 wherein a demisting device is placed above where said liquid oxygenate substantially free of catalyst fines is introduced.

16. The process of claim 1 wherein said quenching takes place in a quench tower wherein said liquid medium containing water is introduced above where said separated vaporous product is introduced, and said treating of said light product fraction occurs downstream of said quench tower.

17. The process of claim 1 wherein said quenching takes place in a quench tower and said treating of said light product fraction at least partially occurs downstream in a suction drum.

18. The process of claim 1 wherein said quenching takes place in a quench tower and said treating of said light product fraction at least partially occurs downstream of said quench tower in a first stage suction drum.

19. The process of claim 17 wherein a vaporous effluent from said quench tower is directed to a suction drum intake from which liquid is removed below said intake and a vaporous overhead taken from the top of said suction drum which is directed to said compressing step.

20. The process of claim 19 wherein said liquid oxygenate substantially free of catalyst fines is introduced to said suction drum above said suction drum intake.

21. The process of claim 20 wherein said liquid oxygenate substantially free of catalyst fines is selected from the group consisting of methanol and ethanol.

22. The process of claim 20 wherein said liquid oxygenate substantially free of catalyst fines is at least a portion of said feedstock comprising oxygenate.

23. The process of claim 20 wherein said liquid oxygenate substantially free of catalyst fines is by-product water from said contacting of the oxygenate with said catalyst, which by-product water is condensed in a recovery unit and treated to reduce catalyst fines content.

24. The process of claim 20 wherein said feedstock comprising oxygenate comprises methanol.

25. The process of claim 20 wherein a vapor-liquid contacting surface is placed between where said liquid oxygenate substantially free of catalyst fines is introduced to said suction drum and said suction drum intake.

26. The process of claim 25 wherein said vapor-liquid contacting surface is provided by at least one material selected from the group consisting of random packing, structured packing and trays.

27. The process of claim 1 wherein said molecular sieve is selected from the group consisting of ALPO-18, ALPO-34, SAPO-17, SAPO-18, SAPO-34, and SAPO-44 and substituted groups thereof.

28. The process of claim 1 wherein said molecular sieve is SAPO-34.

29. The process of claim 1 wherein said liquid medium containing water and catalyst fines contains at least about 0.01 wt% catalyst fines and said liquid oxygenate substantially free of catalyst fines contains less than about 0.01 wt% catalyst fines.

30. The process of claim 1 wherein said liquid medium containing water and catalyst fines contains at least about 0.001 wt% catalyst fines and said liquid oxygenate substantially free of catalyst fines contains less than about 0.001 wt% catalyst fines.

31. The process of claim 1 wherein said liquid medium containing water and catalyst fines contains at least about 0.0001 wt% catalyst fines and said liquid oxygenate substantially free of catalyst fines contains less than about 0.0001 wt% catalyst fines.

32. An apparatus for converting oxygenates to olefins which comprises:
a fluidized bed reactor for contacting a feedstock comprising oxygenate with a catalyst comprising a molecular sieve under conditions effective to produce a deactivated catalyst having carbonaceous deposits and a product comprising said olefins;
a separator for separating said deactivated catalyst from said product to provide a separated vaporous product which contains catalyst fines;
a quench tower for quenching said separated vaporous product with a liquid medium containing water and catalyst fines, in an amount sufficient

for forming a light product fraction comprising light olefins and catalyst fines and a heavy product fraction comprising water, heavier hydrocarbons and catalyst fines;

a treater for treating said light product fraction by contacting with a liquid oxygenate substantially free of catalyst fines to provide a light product fraction having reduced catalyst fines content and a liquid fraction of increased fines content;

a compressor for compressing said light product fraction having reduced catalyst fines content; and

a recovery train for recovering said light olefins from said compressed light product fraction.

33. The apparatus of claim 32 which further comprises:
a line to recycle at least a portion of said liquid fraction of increased fines content to said reactor.

34. The apparatus of claim 32 which further comprises:
a recovery unit for condensing by-product water from said reactor and a treater to at least partially remove catalyst fines from the condensed by-product water.

35. The apparatus of claim 32 which further comprises:
a steam boiler having a source of boiler feed water.

36. The apparatus of claim 32 which further comprises:
a line to recycle at least a portion of said heavy product fraction comprising water, heavier hydrocarbons and catalyst fines to said quench tower as said liquid medium containing water and catalyst fines.

37. The apparatus of claim 36 wherein said line further comprises at least one of a heat exchanger to remove heat from said heavy product fraction and a stripper to strip oxygenate from said heavy product fraction.

38. The apparatus of claim 32 wherein said quench tower comprises in ascending order:
an inlet for introducing said separated vaporous product;
an inlet for introducing said liquid medium containing water; and
said treater.

39. The apparatus of claim 38 wherein:
said treater comprises a liquid draw device having an outlet from which said liquid fraction of increased fines content is taken; and
said quench tower comprises an inlet above said liquid draw device for introducing said liquid oxygenate substantially free of catalyst fines.

40. The apparatus of claim 39 wherein said liquid draw device is a chimney tray.

41. The apparatus of claim 40 wherein a vapor-liquid contacting surface is placed between said liquid draw device and said inlet for introducing said liquid oxygenate substantially free of catalyst fines.

42. The apparatus of claim 41 wherein said vapor-liquid contacting surface is provided by at least one material selected from the group consisting of random packing, structured packing and trays.

43. The apparatus of claim 42 wherein a demisting device is placed above said inlet for introducing said liquid oxygenate substantially free of catalyst fines.

44. The apparatus of claim 32 wherein said treater is located downstream from said quench tower.

45. The apparatus of claim 32 which further comprises a suction drum located between said quench tower and said compressor.

46. The apparatus of claim 45 wherein said suction drum comprises a treater for treating said light product fraction by contacting with a liquid oxygenate substantially free of catalyst fines to provide a light product fraction having reduced catalyst fines content and a liquid fraction of increased fines content.

47. The apparatus of claim 46 wherein said suction drum is a first stage suction drum.

48. The apparatus of claim 46 wherein said suction drum comprises:
an intake for receiving vaporous effluent from said quench tower;
a lower outlet from which liquid is removed; and
an overhead outlet from which a vaporous overhead is taken for said compressor.

49. The apparatus of claim 48 wherein said suction drum comprises an inlet for introducing said liquid oxygenate substantially free of catalyst fines above said suction drum intake.

50. The apparatus of claim 49 wherein said inlet for introducing said liquid oxygenate substantially free of catalyst fines is connected to a treater for reducing catalyst fines content supplied by a recovery unit which condenses by-product water taken from said reactor.

51. The apparatus of claim 49 which further comprises a boiler for making steam.

52. The apparatus of claim 49 which further comprises a vapor-liquid contacting surface placed between said inlet for introducing said liquid oxygenate substantially free of catalyst fines to said suction drum and said suction drum intake.

53. The apparatus of claim 52 wherein said vapor-liquid contacting surface is provided by at least one material selected from the group consisting of random packing, structured packing and trays.